WHAT IS CLAIMED IS:

1. A SONOS-type device comprising:

   a tunneling dielectric,

   a dielectric charge storage layer in contact with the tunneling dielectric, the charge storage layer comprising a first dielectric film and a second dielectric film, wherein the first and the second dielectric films are formed of different materials; and

   a blocking dielectric in contact with the charge storage layer.

2. The SONOS-type device of claim 1 wherein the first or the second dielectric film comprises a dielectric material with a dielectric constant greater than or equal to 3.9.

3. The SONOS-type device of claim 1 wherein the first dielectric film comprises silicon nitride, silicon dioxide, hafnium oxide, aluminum oxide, zirconium oxide, or tantalum pentoxide.

4. The SONOS-type device of claim 3 wherein the first dielectric film comprises silicon nitride and the second dielectric film comprises silicon dioxide.

5. The SONOS device of claim 1 wherein the charge storage layer further comprises a third dielectric film.

6. The SONOS-type device of claim 5 wherein the first dielectric film and the third dielectric film are formed of the same material, and the second dielectric film is interposed between the first and third dielectric films.

7. The SONOS-type device of claim 6 further comprising a semiconductor channel region in contact with the tunneling dielectric.

8. The SONOS-type device of claim 7 further comprising a gate electrode in contact with the blocking dielectric.

9. The SONOS-type device of claim 8 wherein the gate electrode comprises polysilicon.

10. The SONOS-type device of claim 8 wherein the gate electrode comprises tungsten.

11. The SONOS-type device of claim 8 wherein the device is a portion of a memory array.

12. The SONOS-type device of claim 11 wherein the memory array is a monolithic three dimensional memory array.

13. The SONOS-type device of claim 7 wherein the semiconductor channel region comprises polysilicon.

14. The SONOS-type device of claim 7 wherein the semiconductor channel region comprises monocrystalline silicon.

15. The SONOS-type device of claim 7 wherein the device is a portion of a memory array.

16. The SONOS-type device of claim 15 wherein the memory array is a monolithic three dimensional memory array.

17. The SONOS-type device of claim 1 wherein the charge storage layer is between about 30 and about 200 angstroms thick.

18. A SONOS-type device comprising:

a tunneling dielectric,

a dielectric charge storage layer in contact with the tunneling dielectric, the charge storage layer comprising a first dielectric film and a second dielectric film, wherein at least one of the first dielectric film and the second dielectric film does not comprise silicon nitride; and

a blocking dielectric in contact with the charge storage layer.

19. The SONOS-type device of claim 18 wherein the first dielectric film does not comprise silicon nitride.

20. The SONOS-type device of claim 19 wherein the first dielectric film comprises a dielectric material with a dielectric constant greater than or equal to 3.9.

21. The SONOS-type device of claim 20 wherein the first dielectric film comprises silicon dioxide, hafnium oxide, aluminum oxide, zirconium oxide, or tantalum pentoxide.

22. The SONOS-type device of claim 21 wherein the second dielectric film comprises silicon nitride.

23. The SONOS-type device of claim 18 further comprising a semiconductor channel region in contact with the tunneling dielectric.

24. The SONOS-type device of claim 23 further comprising a gate electrode in contact with the blocking dielectric.

25. The SONOS-type device of claim 24 wherein the gate electrode comprises polysilicon.

26. The SONOS-type device of claim 24 wherein the gate electrode comprises tungsten.

27. The SONOS-type device of claim 24 wherein the device is a portion of a memory array.

28. The SONOS-type device of claim 27 wherein the memory array is a monolithic three dimensional memory array.

29. The SONOS-type device of claim 23 wherein the channel region comprises polysilicon.

30. The SONOS-type device of claim 23 wherein the channel region comprises monocrystalline silicon.

31. The SONOS-type device of claim 23 wherein the device is a portion of a memory array.

32. The SONOS-type device of claim 31 wherein the memory array is a monolithic three dimensional memory array.

33. A SONOS-type device comprising:

a tunneling dielectric;

a blocking dielectric;

a first dielectric charge storage film in contact with the blocking dielectric comprising a first material; and

a second dielectric charge storage film comprising a second material, the second charge storage film in contact with the first charge storage film,

wherein the second material and the first material are not the same material, and wherein the first charge storage film and the second charge storage film are disposed between the tunneling dielectric and the blocking dielectric.

34. The SONOS-type device of claim 33 wherein the first material comprises a dielectric material with a dielectric constant greater than or equal to 3.9.

35. The SONOS-type device of claim 34 wherein the first material is silicon nitride, silicon dioxide, hafnium oxide, aluminum oxide, zirconium oxide, or tantalum pentoxide.

36. The SONOS-type device of claim 35 further comprising a third charge storage film in contact with the second charge storage film.

37. The SONOS-type device of claim 36 further comprising a fourth charge storage film in contact with the third charge storage film, the first and third charge storage films comprising the first material, and the second and fourth charge storage films comprising the second material.

38. A SONOS-type device comprising:

a tunneling dielectric;

a blocking dielectric;

a first dielectric charge storage film disposed between the tunneling dielectric and the blocking dielectric; and

a second dielectric charge storage film disposed between the tunneling dielectric and the blocking dielectric,

wherein at least one of the first charge storage film and the second charge storage film does not comprise silicon nitride, and

wherein no material disposed between the tunneling dielectric and the blocking dielectric is a conductor or a semiconductor.

39. The SONOS-type device of claim 38 further comprising a channel region in contact with the tunneling dielectric.

40. The SONOS-type device of claim 39 further comprising a gate electrode in contact with the blocking dielectric.

41. The SONOS-type device of claim 40 wherein the gate electrode is above the channel region.

42. The SONOS-type device of claim 40 wherein the channel region is above the gate electrode.

43. The SONOS-type device of claim 38 further comprising a gate electrode in contact with the blocking dielectric.

44. The SONOS-type device of claim 38 wherein:
the first charge storage film is a first material,
the second charge storage film is a second material,
and the first material and the second material are not the same material.

45. The SONOS-type device of claim 38 wherein the first material is a dielectric material with a dielectric constant greater than or equal to 3.9

46. The SONOS-type device of claim 45 wherein the first material is silicon nitride, silicon dioxide, hafnium oxide, aluminum oxide, zirconium oxide, or tantalum pentoxide.

47. A method for making a SONOS-type memory cell, said method comprising the steps of:
forming a semiconductor channel region;
forming a tunneling dielectric;
forming a blocking dielectric;
forming a gate electrode;
forming a first charge storage film between the tunneling dielectric and the blocking dielectric; and

forming a second charge storage film in contact with the first charge storage film, wherein at least one of the first charge storage film and the second charge storage film is not silicon nitride; and

wherein the first charge storage film is in contact with the blocking dielectric.

48. The method of claim 47 wherein the channel region is over the gate electrode.

49. The method of claim 47 wherein the gate electrode is over the channel region.

50. The method of claim 47 wherein the SONOS-type memory cell is a portion of a memory array.

51. The method of claim 50 wherein the memory array is a monolithic three dimensional memory.

52. The method of claim 47 wherein the first charge storage film or the second charge storage film is between about 10 and about 190 angstroms thick.

53. A memory array comprising a SONOS-type cell, said cell comprising:

a tunneling dielectric,

a dielectric charge storage layer in contact with the tunneling dielectric, the charge storage layer comprising a first dielectric film and a second dielectric film, wherein the first and the second dielectric films are formed of different materials; and

a blocking dielectric in contact with the charge storage layer, wherein the array is a nonvolatile memory array.

54. A monolithic three-dimensional memory array comprising a plurality of SONOS-type memory cells, each cell comprising:

a tunneling dielectric,

a dielectric charge storage layer in contact with the tunneling dielectric, the charge storage layer comprising a first dielectric film and a second dielectric film, wherein at least one of the first dielectric film and the second dielectric film does not comprise silicon nitride; and

a blocking dielectric in contact with the charge storage layer,

wherein the memory array comprises at least two levels of SONOS-type memory cells, one level formed vertically over the other.

55. A memory cell comprising:

a channel region; and

a tunneling oxide grown by an in situ steam generation process, the tunneling oxide in contact with the channel region,

wherein the memory cell is a portion of a monolithic three dimensional memory array comprising at least two levels of memory cells, one level formed vertically over the other.

56. The memory cell of claim 55 further comprising:

a blocking oxide; and

a dielectric charge storage layer in contact with the blocking oxide and the tunneling oxide.

57. The memory cell of claim 56, wherein the dielectric charge storage layer comprises:

a first dielectric charge storage film comprising a first material; and

a second dielectric charge storage film comprising a second material, wherein the first material and the second material are not the same material.

58. The memory cell of claim 57 wherein the first material is silicon nitride, silicon dioxide, hafnium oxide, aluminum oxide, zirconium oxide, or tantalum pentoxide.

59. The memory cell of claim 55 wherein the in situ steam generation process is performed at a temperature of between about 750 degrees Celsius and about 1050 degrees Celsius.